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Determination of Dutch NO_x emission factors for Euro-5 diesel passenger cars

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Samenvatting

Dit rapport geeft een onderbouwing van de aanpassing van de emissiefactoren voor Euro-5 diesel personenauto's, zoals aangeleverd aan diverse werkgroepen van het ministerie van I & M. Jaarlijks worden de emissiefactoren voor het wegverkeer officieel vastgesteld in maart, waarbij deze aanpassing in maart 2013 meegenomen zal worden.

Van jaar tot jaar zijn er meestal kleine veranderingen voor de detail emissiefactoren per voertuigcategorie. Echter, de NO_x emissies van dieselvoertuigen zijn hoger dan de verwachting op grond van de aanscherping van de emissie eisen. De voertuigen voldoen allemaal aan de limiet op de officiële test, maar de doorwerking daarvan in de praktijk blijkt beperkt. Dit rapport geeft de resultaten uit het meetprogramma voor de praktijk emissies van NO_x Euro-5 diesel personenauto's en de daarvoor gehanteerde methodiek.

Naar aanleiding van voorlopige resultaten van de NO_x (stikstofoxides) uitstoot van nieuwe, Euro-5 diesel personenauto's, is er een extra meetprogramma geweest van een representatieve groep auto's (aug/sept 2012). Uiteindelijk zijn er in totaal 11 auto's onder identieke omstandigheden getest. Uit deze testresultaten zijn de nieuwe emissiefactoren voor 2013 afgeleid. De bandbreedte van +/- 5% in de emissiefactor wordt voornamelijk bepaald door verschillen tussen voertuigen. Dit resultaat is betrouwbaar omdat de steekproef ruim 50% van de verkochte verbrandingsmotoren en 25% van de voertuigmodellen omvat.

De praktijk NO_x emissies van Euro-5 diesel personenauto's zijn hoger dan de emissies van Euro-4. De waarden zijn gemiddeld 3 keer de limietwaarde van de NEDC test (0.18 g/km). Op de snelweg is de emissie 0.6 g/km, in de stad, onder normale condities 0.63 g/km. Voor 10 van de 11 auto's, kan de verhoogde NO_x uitstoot in de praktijk niet verklaard worden door het verschil in rijdynamiek tussen NEDC test en praktijksituatie.

NO_x[g/km]	Stad	Buitenweg	Snelweg
Euro-4	0.51	0.38	0.39
Euro-5 old	*0.37*	*0.27*	*0.28*
Euro-5 new	***0.63***	***0.34***	***0.61***

De praktijkomstandigheden, ook door de introductie van nieuwe dynamische snelheidslimieten en een veranderende voertuigvloot samenstelling, geven een onzekerheid in de emissiefactoren. Een maximale bandbreedte van +/- 15% op de emissiefactoren kan als onzekerheid worden aangenomen. De inschatting van deze nieuwe emissiefactoren is eerder aan de lage dan aan de hoge kant.

Internationaal zijn er nog lage emissiefactoren, ramingen en totalen voor NO_x Euro-5 diesel personenauto's in omloop. Deze getallen zijn gebaseerd op de optimistische reductie, op basis van de lagere limiet. In de komende jaren zullen, naar verwachting, deze getallen ook bijgesteld worden, van ongeveer 0.3 naar 0.6 g/km.

Contents

1 Introduction

The recent emission tests of Euro-5 diesel passenger cars are evaluated.
The present report describes the translation of these results to the national Dutch emission factors as used in the air-quality models. The large change in the previous preliminary estimates in the emissions of this category of vehicles, to the current emission factors warrants the separate explanation.

Vehicle emissions play an important role in the NO_2 concentration in the ambient air, especially in the urban environment. From all the vehicles, the vehicles with a diesel engine are the main contributors. The NO_x emission during real-world operation has not dropped significantly despite the stricter emission limits in the NEDC test for every Euro class (see Table 1), which has been tested eventually. For Euro-5 there is confidence in the measurements, to change the optimistic value to the emission factor based directly on the test programme. This report present these values, and the remaining issues. The analysis of new emission data of Euro-5 diesel passenger cars is briefly presented in this report, and the resulting real-world emission factors (CAR) are reported. Indications that the common vehicles have higher emission than the Euro-4 vehicles is investigated.

Table 1: Diesel emission limits (Euro-1 and 2 a combined limit) and final year of introduction

Emission limit	NO_x [g/km] (or NO_x+HC)	Introduction year
Euro-1	0.97	1993
Euro-2	0.7	1996
Euro-3	0.5	2000
Euro-4	0.25	2005
Euro-5	0.18	2009
Euro-6	0.08	2014

The emission factors as used in 2012 indicate the same optimism for the Euro classes 5 and 6 (see Table 2), however, for the Euro classes with test data the emission factors are higher. The last update of the emission factors of diesel passenger cars was in 2009. The Euro-4 diesel NO_x emission factors were updated, based on emission tests. This was also an increase with respect to the initial estimate.

Although the NO_x emissions of diesel vehicles turn often out to be higher than initially estimated, on the basis of the emission limits, this is not the case for other emissions and for petrol vehicles. For other categories, real-world emission are in most cases lower than the limit on the test. For those cases, the test is indeed a proper tool to achieve lower real-world emissions.

Table 2: The previous Dutch NO_x emission factors for diesel passenger cars as used in CAR 2012 (the standard categories are: stad=urban, buitenweg= rural, snelweg = motorway) in italics the preliminary estimates in the current values, in bold the new values

NO_x[g/km]	Stad	Buitenweg	Snelweg
Euro-0	0.86	0.66	0.63
Euro-1	0.73	0.45	0.56
Euro-2	1.02	0.55	0.5
Euro-3	0.89	0.55	0.54
Euro-4	0.51	0.38	0.39
Euro-5 old	*0.37*	*0.27*	*0.28*
Euro-5 new	***0.63***	***0.34***	***0.61***
Euro-6	*0.16*	*0.12*	*0.12*

The fraction of NO_2 has increased over the legislative classes in the total NO_x emission which is the sum of NO and NO_2 (this trend seems to have been changed with Euro-5). A decrease of total NO_x emission does not necessarily results in a decrease in local, road-side, NO_2 concentration, as the conversion of NO to NO_2 is limited at short distances from the source.

Table 3: The previous Dutch NO_2 emission factors for diesel passenger cars as used in CAR 2012 (the standard categories are: stad=urban, buitenweg= rural, snelweg = motorway) in italics the preliminary estimates in the current values, in bold the new values

NO_2[g/km]	Stad	Buitenweg	Snelweg
Euro-0	0.13	0.10	0.09
Euro-1	0.11	0.07	0.08
Euro-2	0.15	0.08	0.07
Euro-3	0.40	0.25	0.24
Euro-4	0.28	0.21	0.22
Euro-5 old	*0.20*	*0.15*	*0.16*
Euro-5 new	***0.19***	***0.10***	***0.20***
Euro-6	*0.09*	*0.07*	*0.07*

The initial expectation is that each new emission limit would result in a reduction of the emission is comparable with the reduction of the limit:

$$Euro4 \Longrightarrow Euro5: \frac{0.18}{0.25} = 72\%$$

Before Euro-5 vehicles were available a reduction of 28% with respect to the Euro-4 emission factors was assumed. The initial tests gave no cause to adapt this assumption. The initial vehicles tested, Euro-5 in 2008 and Euro-6 currently indicate that such reductions are possible for real world emission. However, later vehicle models seem to undo the expectations the early adapters raise. The introduction of Euro-5 vehicles spans a number of years, from third quarter 2008 till 100% in first quarter 2011.

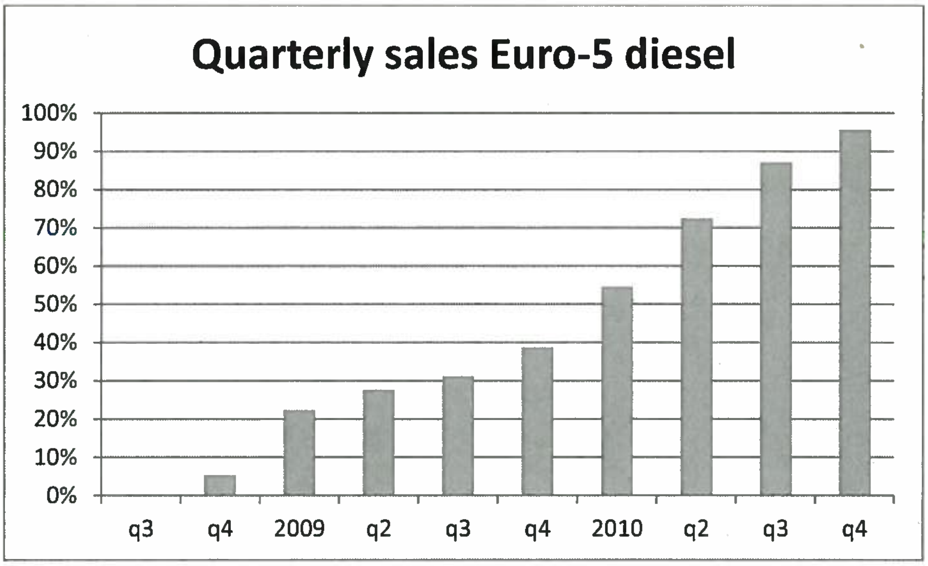

Figure 1: The introduction of Euro-5 in The Netherlands

The number of engines in diesel Euro-5 vehicles is limited. The same engine (cylinder volume [cc] with the same rated power [kW]) is used in a large number of vehicle models of different brands. The 11 most common engines span 54% of the Dutch fleet. Taking the most common vehicle brands and models, this is also 25% of the actual fleet. The variation among vehicles, with the same engine, is foremost the weight and aerodynamic resistance. Whether, different brands using the same engine, have different engine controls with significantly different emissions is not clear from the current data.

Hence with a limited number of tests on 11 vehicles, the emissions of the actual Dutch Euro-5 diesel fleet, as sold in the period 2008 till 2012 is covered in the test programme. The current vehicles have mainly smaller engines, resulting in lower type-approval fuel consumption. All engines in the common group (dominant 54%) are below 2000 cc. The early adapters are usually the larger models with larger engines.

The presence of the vehicles on the road varies only little with the vehicle make and model. From data from the fuel-pass company Travelcard, the mileage of the new Euro-5 diesel vehicles is 42 000 km a year. Only the smaller cars, with higher sales numbers and below 1200 kg, the annual mileage is 35 000 km/yr, 17% less. These numbers are in line with CBS average of 38 000 km/yr. Hence, the fleet average emission for diesel Euro-5 vehicles is a good representation of the vehicle fleet passing an arbitrary road location, i.e., the rolling-fleet. There is no need to weigh the emissions of heavier, business-class, vehicles more.

1.1 NO_x emissions from combustion

The emission of nitrogen oxides is common to all combustion processes in air. The nitrogen in the air in combination with the high temperature produces these nitrogen

oxides (NO and NO_2). NO is converted in ambient air to NO_2 in the presence of ozone (O_3).

Spark ignition vehicles with a three-way catalyst convert back the NO_x to non-pollutants: N_2 , H_2O and CO_2. The concept is robust and real-world NO_x emissions are typically lower than the emission limit, as the only substantial emission occurs at cold start, which is properly covered in the test procedure.

Diesel engine reduce NO_x via three main principles: combustion process optimization, i.e., by diesel injection timing and multiple injections, exhaust-gas recirculation (EGR), and AdBlue after treatment selective catalyst reduction (SCR). The latter is only common in heavy duty vehicles and the larger Euro-6 passenger cars.

The methods to reduce NO_x in diesel exhaust gas is not yet as robust as the three-way catalysts for gasoline vehicles. Hence, the test does not automatically guarantee a low NO_x emission the real-world conditions for diesel. In recent years many instances of non-functioning NO_x reduction have been found.

The real-world driving conditions are covered by Dutch and European driving cycles, which can be used in the laboratory to test. Emission control of the vehicles does not seem to be optimized for such driving cycles. This is expounded in a separate section 3.3. The (laboratory) cold start results are sometimes an indication for an adapted control strategy. However, for the greater part the emission control on the NEDC test seems uncorrelated to the emission control on other tests as seen in section 3.3. The specific emission: grams NO_x per kg CO_2 are the clearest indication of the different emission-control strategies.

Two real-world tests commonly carried out are the CADC test (common Artemis driving cycle; low motorway velocity variant with 130 km/h) and the TNO Dynacycle. The Dynacycle has several hard accelerations in the test, and it covers more of the high load conditions than the CADC test does. Both tests contain typically more dynamics than common on the Dutch roads in the absence of heavy congestion.

When emission control does not function properly, it typically does so at the higher engine loads and dynamics. In the case of Euro-4 this was clearly the case. Constant driving with a Euro-4 diesel vehicle yields much lower emission than aggressive driving, e.g., overtaking on the motorway and strong accelerations (> 2 m/s^2) in urban conditions. For Euro-5 the emission control seems to have less failures or incidents, but a limited optimization for real-world driving. By inspecting, as is done in section 3.3, the NO_x emission rate [mg/s], in relation to the CO_2 emission rate [g/s], one can see that for many Euro-5 vehicles the ratio is near constant. For Euro-4 vehicles the ratio NO_x/CO_2 increases with higher rates. Consequently, Euro-4 vehicles perform typically better on low-load driving.
This is elaborated in section 3.3.

2 Emission tests and emission factors

The emission tests were carried out at the Horiba laboratory in Germany.
In Figure 2 the CADC results of 11 Euro-5 diesel vehicles are reported. There is a large variation between vehicles in the results, mainly in the urban and motorway parts of the test.

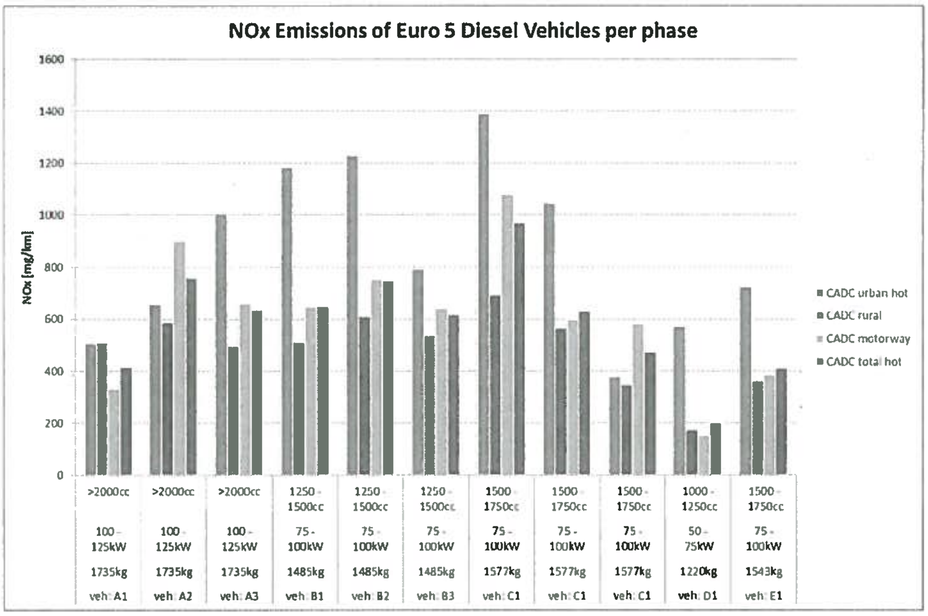

Figure 2: The CADC as real-world emission. The test result of the 11 vehicles tested, separate of each part: urban, rural, and motorway (130 km/h), and combined.

Taking the CADC tests as an indication of the emission factors, weighing each vehicle the same, the emission factors would be: 0.89, 0.50, and 0.63 g/km respectively for urban, rural, and motorway driving (no distinction in degree of congestion can be made). The CADC test is considered dynamic compared to the Dutch average driving, but would correspond to situations with more congestion. This is not only the fault of the test, but also the result of having to cover a large number of driving conditions in the rather limited time of a test (~45 minutes).

The driving behavior, distinguishing degrees of congestion, as used in the national emission factors SRM1 or CAR, lead to slightly lower values than the CADC test result. This is due to a more tame driving on the road than in the test.

The emission factors are determined with Versit+, from the CADC results. The emissions on the tests are separated in different velocity and acceleration regimes. This lead to an emission map: emission rates in [mg/s] for specific velocity and acceleration combinations. These maps are combined with the standard driving conditions as described for each of the emission factors: dependent on road types and congestion levels. The traffic situations Dutch labels “stad zware congestie” etc. are described in the legal documents to be used for the air-quality calculations. The old Euro-5 emission factors are based on Euro-4 emission tests, scaled with the stricter emission limit.

Table 4: NO_x emission factors for CAR, and the test result as comparison (note a single urban emission factor, in the absence of congestion classes)

NO_x [mg/km]	New E5	Old E5	Euro4	CADC
Stad zware congestie	1070	500	690	
Stad normaal	632	310	430	890
Stad lichte congestie	579	350	480	
Buitenweg	344	270	380	499
Snelweg	606	280	390	629

With the exception of the rural all the Euro-5 emission factors are higher than Euro-4. The values are up to 55% higher (both motorway and urban heavy congestion). The stricter emission limit has no positive effect on the real-world emission of NO_x.

The direct NO_2 emission is a different story. With the introduction of the closed particulate filter (DPF), the NO_2 fraction has decreased from 55% to about 30% [29%-32%]. The technological change from Euro-4 to Euro-5 includes, seemingly, a limited oxidation of NO to NO_2 in the exhaust-gas after-treatment, i.e., oxidation catalyst, resulting a lower fraction. For Euro-4 an oxidation catalyst is used to reduce the particulate matter emission.

Table 5: The NO_2 emission factors for CAR, with the three average CADC test results as comparison.

NO_2 [mg/km]	New E5	Old E5	Euro4	CADC
Stad zware congestie	332	273	379	
Stad normaal	193	171	237	267
Stad lichte congestie	173	190	264	
Buitenweg	101	149	207	150
Snelweg	195	156	216	189

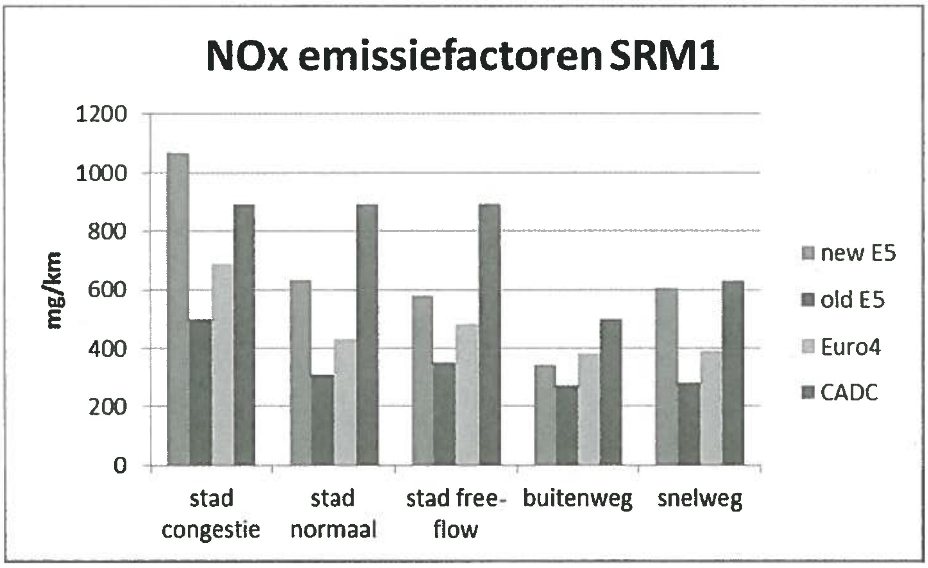

Figure 3: The results of Table 4 visualized.

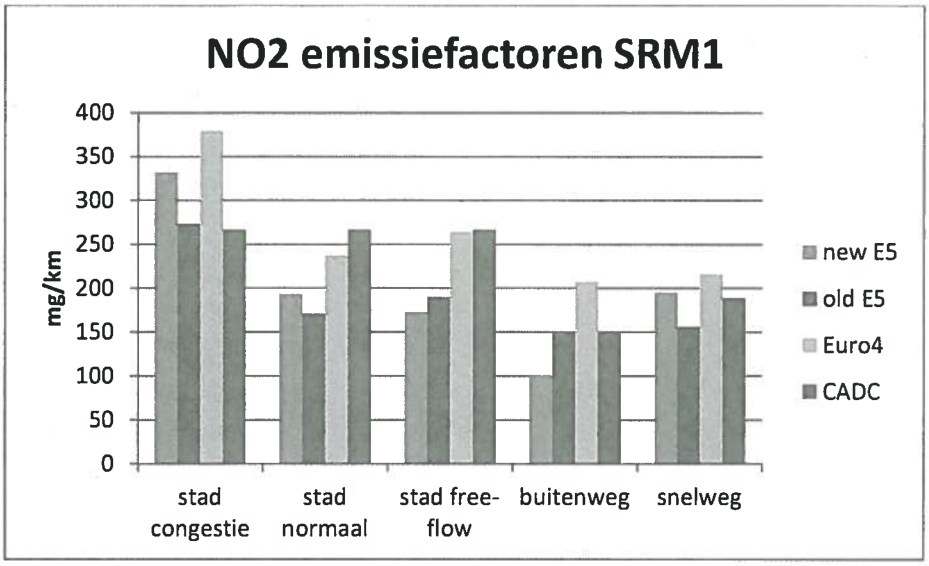

Figure 4: The results of Table 5 visualized.

Other emission factors, like CO_2, CO, and HC did go down, indicating, in that respect, superior technology in Euro-5 over Euro-4. These emissions play however, only a little role.

3 Additional investigations and indirect evidence

The increase in NO_x emissions for Euro-5 diesel vehicles is substantial. The Versit+ methodology is on the conservative side. The emission factors are calibrated in the national air-quality programme with road-side concentrations. However, additional evidence conforms these findings, and allow for an estimation of the bandwidth in the bias, which is about 15%, with more evidence of higher emissions than of lower.

The source of this additional data is threefold: PEMS and coast-down testing, international results, and the specific emissions. The differences and indications of these additional evidences are discussed in this chapter. Note, that these results are not included in the emission factors, due to the limited basis in number of vehicles, different testing, fleet, or conditions, and not fully tested methodologies.

3.1 PEMS and coast down testing

The current emission factors are based on the data from chassis dynamometer tests. Sufficient vehicles were tested in identical circumstances. Furthermore, the methodology of the emission model Versit+ is tuned towards these tests. Typically 10 or more vehicles of the same technology are needed to cover the existing variation among the vehicles in emission results. This requirement is fulfilled, however, with Euro-5, the variation between vehicles seem more systematic than before, which is under investigation. For example excluding the best and worst-case vehicles from the set causes variations of the NO_x emission average of 5% up or down, similar in both directions. This is with the exception of the cold-start test, were the range is more than double.

Apart from the chassis dynamometer tests there are a number of other relevant tests, which may come closer to the real-world emission, but have yet to prove reproducibility and significance, partly due to the limited number of four vehicles tested. Hence chassis dynamometer tests are the ideal setting for crosswise comparisons; between vehicles and between Euro-classes. The environment is controlled, and settings such as temperature, humidity and total vehicle weight, to name a few, are standard.

A number of disadvantages, in the sense of predicting real-world emissions, of chassis dynamometer testing are:

- Relatively short tests, with limited driving in small speed variations sections
- Temperature higher than Dutch outdoor temperature, wind effects excluded
- Higher vehicle weights (luggage, passengers) are not tested
- Auxiliaries, power-steering, and lights are typically not used
- Rolling and aerodynamic resistance values from the manufacturer

Overall, it can be assumed that chassis dynamometer testing leads to an under-estimation of the real-world emission. Dynamic driving compensates for that in the actual test.

Recent coast down tests indicate that under normal Dutch vehicle maintenance (tyres, tyre pressure, wheel alignment, etc.) and road surface conditions the rolling resistance is substantially higher than expected from the type-approval. It can add

11% to the fuel consumption[1]. The consequences for NO_x emissions are expected to be in the same order.

PEMS testing avoids such complications as matching rolling resistance with on-road values, by testing a vehicle on the road. This testing is done with a Portable Emission Measurement System (PEMS). The weight of the vehicle is higher due to the equipment, operator, and energy supply, the external conditions may vary, and the driving behavior is not fully specified as congestion and traffic lights may affect the actual driving. The last years a number of such tests has been carried out with diesel Euro-5 vehicles. The results are similar to those of the chassis dynamometer tests, for normal dynamics.

The longer driving with PEMS allows for grouping driving behavior in segments. From the four diesel Euro-5 vehicles tested, which is a limited set, two preliminary conclusion can be made:

- Constant driving can still bring the NO_x emission down by 10-20%.
- From 100 km/h to 130 km/h NO_x emission increases strongly, up to 100% for two of the vehicles.

3.2 International results

Apart from Dutch testing, Germany, Austria, Switzerland, and Sweden also have similar national test programmes. The emission factors in HBEFA, mainly based on German and Austrian test results, are also due for an update for Euro-5 and Euro-6, early 2013. Within the international collaboration ERMES some of this preliminary data is shared informally. The emission factors of HBEFA for NO_x are likely to be very similar, to slightly higher, for comparable situations, and the NO_2 fraction is closer to 40%, than our finding of around 30%. Other testing programmes and emission factors vary from the Dutch programme in a number of aspects:

1. *Different vehicles*: there are a large number of small and low powered diesel vehicles in The Netherlands, compared to other European countries. These vehicles are tested in the Dutch programme.
2. *Tests*: CADC test come in two types: 130 km/h and 150 km/h. Other countries often use the 150 km/h, while in The Netherlands the 130 km/h variant is always used. On the 150 km/h variant of the CADC test, with Euro-5 vehicles, values above 1 gram/km NO_x emissions are not uncommon.
3. *Driving behavior*: The Dutch emission factors are based on Dutch driving behavior. Separate driving behavior for speed limits of 80 km/h and recently 130 km/h are determined on the road. In the densely populated Netherlands, driving seems distinctly different from other countries.
4. *Protocol*: The Dutch test programme serves multiple purposes. Not only the emission factors are determined, but also the in-use compliance is tested. In order to compare findings with those of the vehicle manufacturer, some of the test settings are closer to the official test than real-world conditions. The separate PEMS test programme is meant to bridge this gap in the future.

[1] TNO-060-DTM-2012-02014 Road load determination of passenger cars, ______________

Apart from the update for HBEFA other emission factors and models will still work with the assumption of a reduction in the emission proportional with the tightening of emission limit from Euro-4 to Euro-5. Typically, it takes two to three years before most numbers, emission factors and emission models are up to date.

In particular road-side air-quality testing will take longer to distinguish an effect of high Euro-5 emissions: the part of the fleet is still small and older vehicles, which will leave the fleet in due course, dominate the total emission. Only after the introduction of Euro-6, the Euro-5 emissions are likely to be the main contributor in the total emission.

3.3 Analysis by specific emission

The standard Versit+ methodology produces emission factors directly from chassis dynamometer tests. However, an increase in emission factors with an increase in emission limit is a reason for concern and a closer examination. The specific emission is a representation of the emission data, which provides some insight in the origins of the higher real-world emissions. In this chapter the additional analysis is presented.

The increase of the real-world emission factors from Euro-4 to Euro-5 is a major concern, as it relates directly to the ambient NO_2 concentrations in urban areas and near motorways in the coming years. The cause is a discrepancy between the type-approval NEDC test and conditions on the road. It seems that the engine control optimization no longer applies to other circumstances than the test. To show the incompatibility of the test emission limits, which are satisfied by all vehicles,and the results on the real-world test, the specific emission is analyzed. The CO_2 emission is related to the power demand. It is known that the power demand in the test is low: hence separating emission by CO_2 emission per second and such indirectly by power demand, can show if the real-world test result can be compatible with the emission limit.

A closer look at the emission data shows a shift in trends, both motorway emission and urban emission increase more than, for example, rural emissions. For Euro-4 the NO_x emission were not strongly correlated with the CO_2 emissions: the specific NO_x emission varies between 3.0 (rural) and 3.9 (motorway) g/kg CO_2. For Euro-5 the variation is limited: between 4.0 and 4.4 g/kg CO_2, with a slight increase with speed. However, higher velocities on the motorway will lead to values up to 5.0 g/kg.

Hence, one can conclude that with Euro-4 the specific NO_x emission still depends on engine load, with Euro-5 this is less the case. Consequently, the high real-world emission of Euro-4 were still somewhat compatible with the NEDC emission limits, however, not for Euro-5. The optimization on the type approval test, typically only needed for the low engine loads, under 30%-50% of the rated power, is no longer visible in most of the real-world emissions.

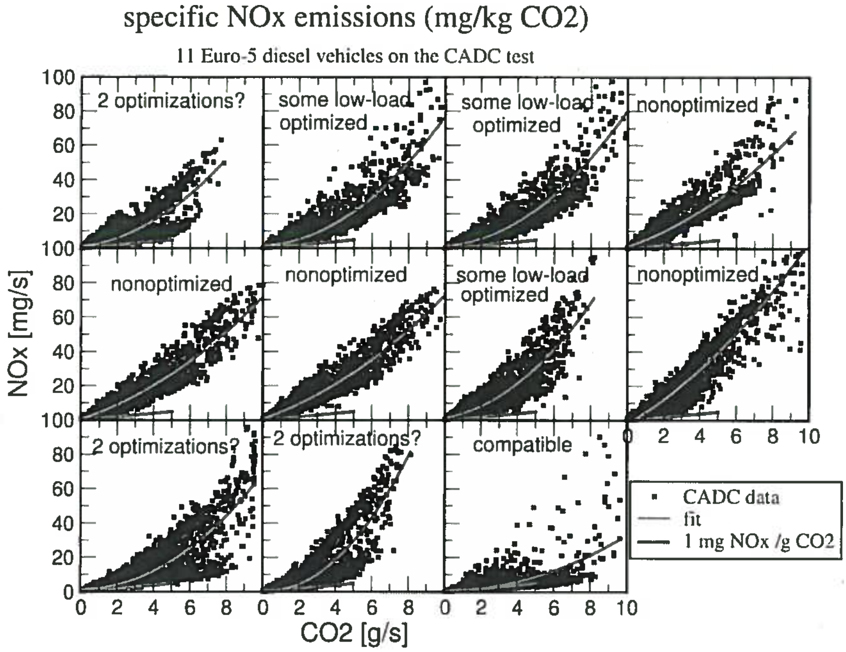

Figure 5: Scatterplots of the modal mass data of the 11 vehicles. The magenta line (below 5 g/s; corresponding to the low-loads on the NEDC) indicates the typical level needed to satisfy the emission limit. Different vehicles have different characteristics: some lower specific emissions at low-load, some switch, and one vehicle somewhat compatible with type approval values.

Since the specific emission is near constant for all driving conditions, a direct relation between fuel consumption and emission exists. Hence, with real-world fuel consumption from alternative sources, the average NO_x emission follows directly. The real-world fuel consumption of 5.5-6.0 liter/100 km is a reasonable assumption for current Euro-5 diesel passenger cars (146 - 159 g/km CO_2), which leads to 0.58 - 0.64 g/km NO_x emission. This is somewhat higher than expected on the basis of the emission factors (e.g. based on 20% urban, 30% rural, and 50% motorway: 0.53 g/km).

4 Conclusions

The NO_x emission factors for Euro-5 are higher than initially estimated. This is the results of the analysis of emission tests on 11 vehicles which represent the current fleet. The emission factors are on average even higher than for Euro-4. The NO_2 emission remains at the same level, with a direct fraction of around 30% from previously 55%.

Some indications exists, from PEMS testing, fuel consumption, and preliminary international results, that real-world driving conditions may yield even higher NO_x emissions. The normal congestion urban and motorway NO_x emission factors are both around 0.6 g/km, the NO_2 fraction therein is around 30%. However, this is counterbalanced by limitations in the knowledge on driving behavior in The Netherlands. All in all an uncertainty of about 15%, both up and down, may be assumed.

From specific emissions, the NEDC tests hardly seem to affect the real-world emissions. All vehicles have low emissions on the NEDC test. The vehicles therefore comply with the emission legislation. Some vehicles still show some lower specific emission at low loads, as occur in the NEDC test. The data from other vehicles seem incompatible with the NEDC test on the same vehicle.

These results raise some concern for the real-world emission of Euro-6 vehicles. Currently, only a very limited number of models of Euro-6 vehicles are available. These are the "early adapters". They perform well on NO_x emissions. However, if the introduction of Euro-4 and Euro-5 are an indication for the trend of the Euro-6 emission factors, little to no reduction is to be expected eventually. On the other hand, upcoming additional legislation in Euro-6 may possibly help to avert the repetition of the current trend as seen with Euro-5 passenger cars.

5 Signature

Delft, 7 December 2012

Projectleader Author

A CAR en Snelweg Emissiefactoren

Emissiefactoren voor personenauto's en bestelauto's Class I (< 1250 kg)

[mg/km] Diesel Euro-5 personenauto's	NOx	NO_2
Stad zware congestie	1070	332
Stad normaal	632	193
Stad lichte congestie	579	173
Buitenweg	344	101
Snelweg gemiddeld	606	195
Snelweg file	1007	335
Snelweg 80 km/h	418	137
Snelweg 100 km/h strenge handhaving	513	167
Snelweg 100 km/h zonder strenge handhaving	527	169
Snelweg 120 km/h	581	180
Snelweg 130 km/h	612	186

Bestelauto's opslagfactoren

Bestelauto's hebben ruimere emissielimieten afhankelijk van het gewicht.
Op grond hiervan worden de bestelauto emissiefactoren geschaald aan de hand van de personenauto's emissiefactoren voor Euro-5:

Voertuig	Gewicht (reference)	Schaling
Class I	M < 1250 kg	100.0%
Class II	1250 < M < 1700 kg	130.6%
Class III	1700 kg < M	155.6%

Op grond van de technologie en het brandstofverbruik van personenauto's en bestelauto's is deze aanname redelijk.
In de verkoop vallen meeste bestelauto's in Class III, een kleiner deel in Class II.
De lichtste categorie, Class I, bevat slechts enkele procenten van de totale diesel bestelauto verkoop.